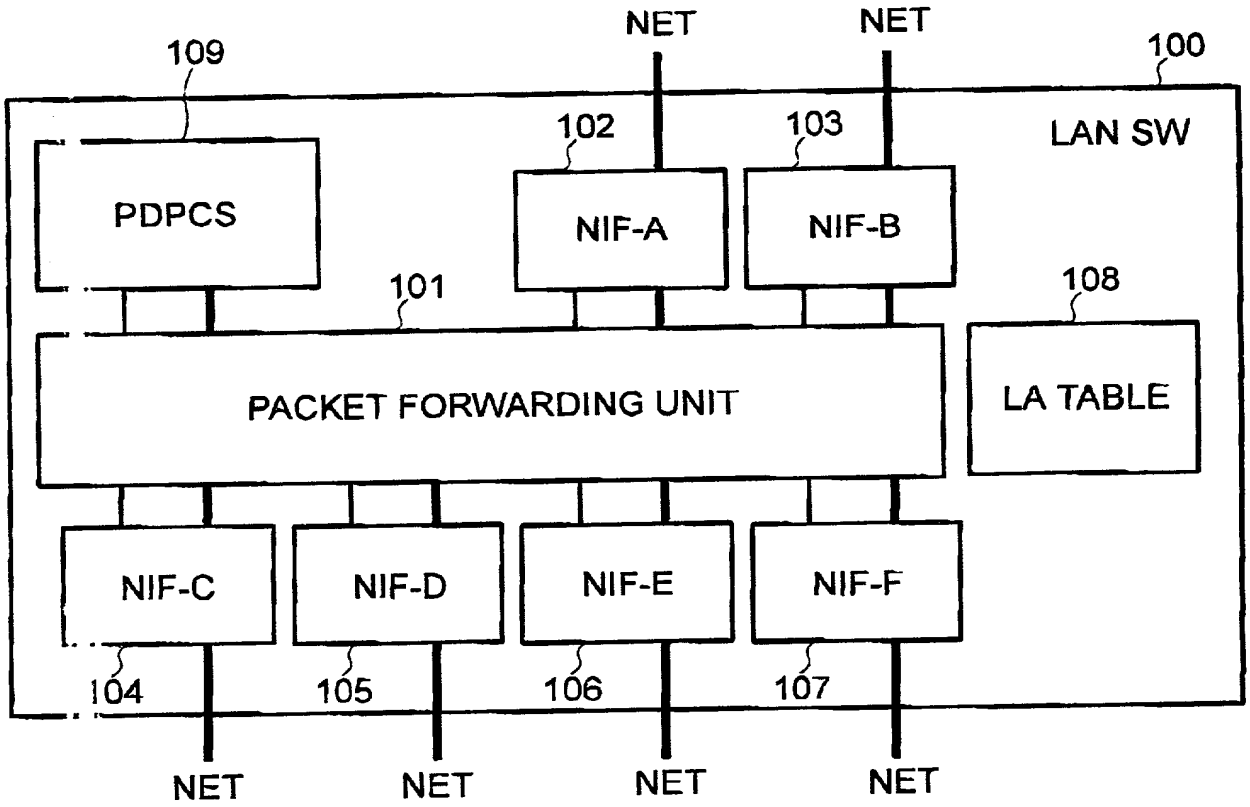
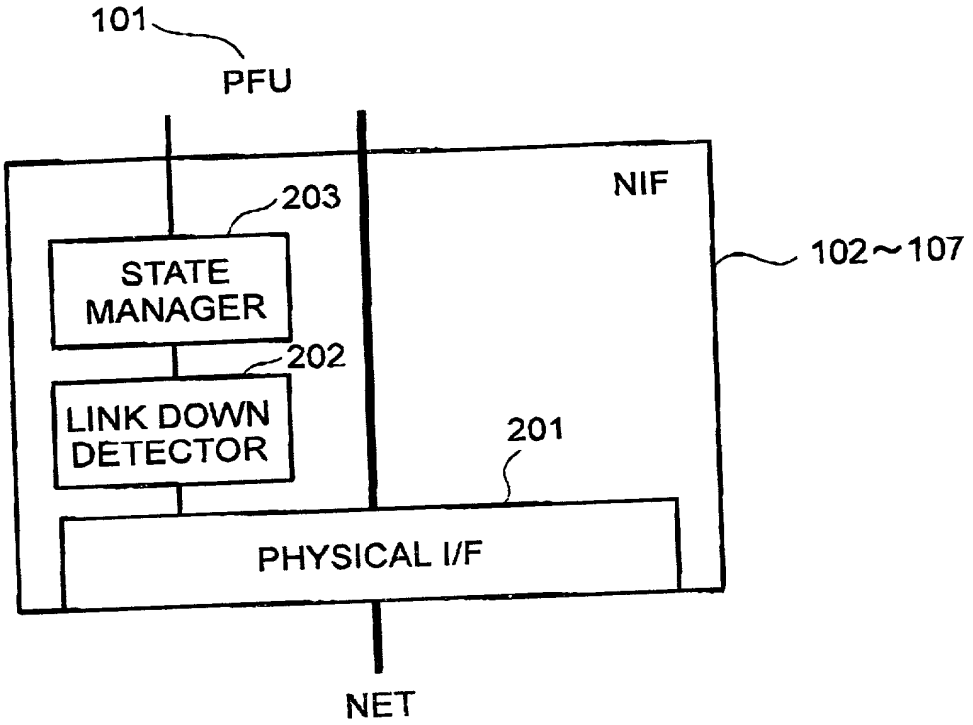
FIG.1



NIF : Network Interface
PDPCS : Processor for Directive Packets to Change State
LA : Learned Address

FIG.2



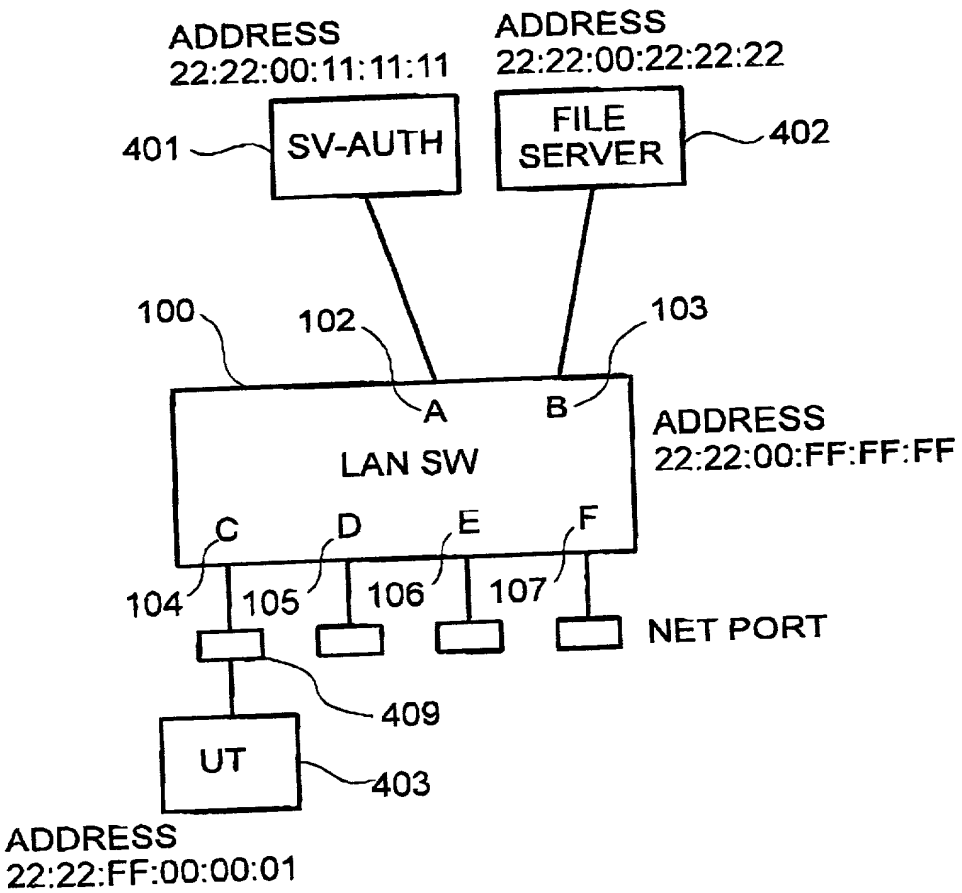
NIF : Network Interface
I/F : Interface
PFU : Packet Forwarding Unit

FIG.3

108 301 302

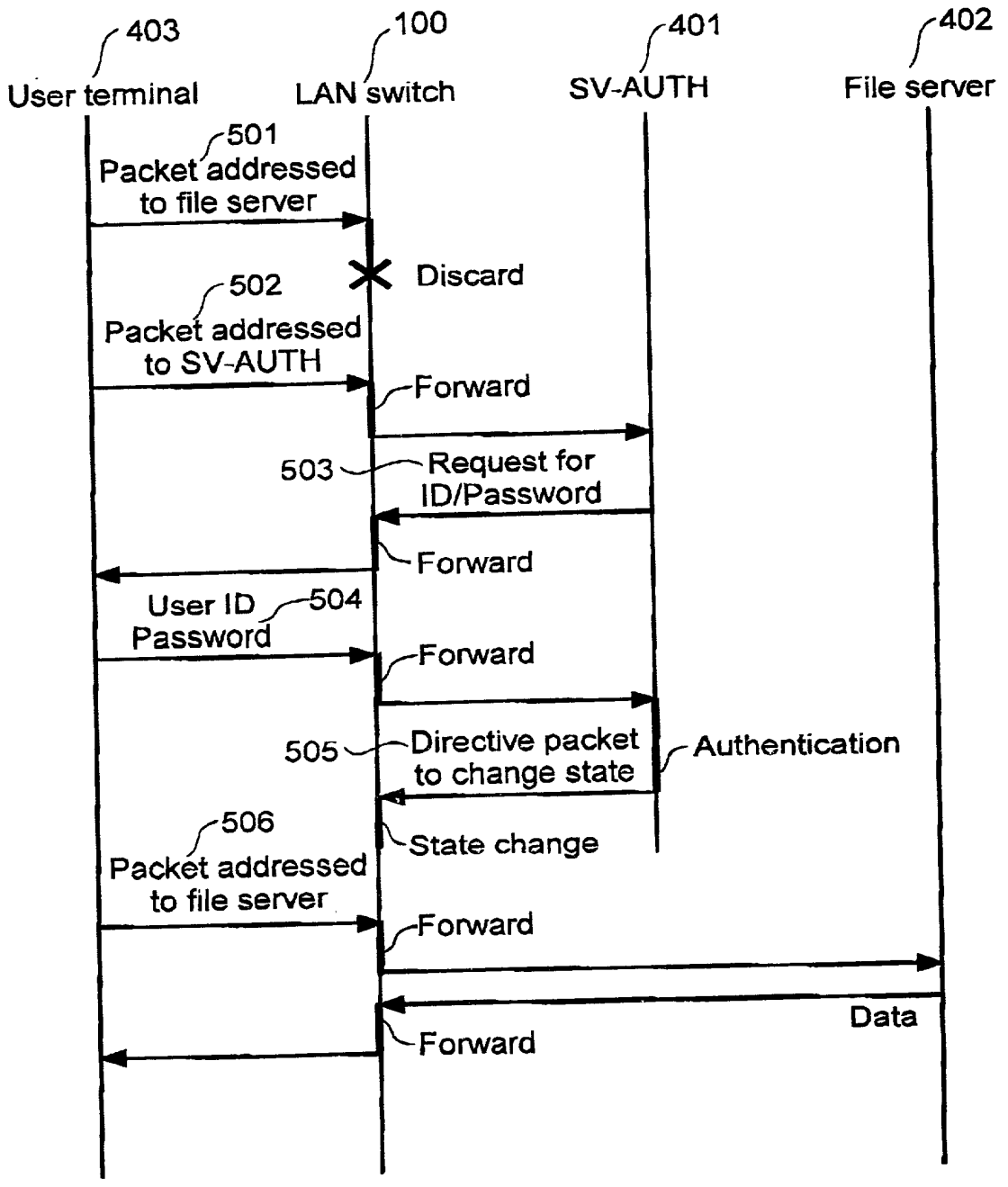
#	Address	Sending Port
1	22:22:00:11:11:11	A
2	22:22:00:22:22:22	B
3	22:22:00:FF:FF:FF	X

FIG.4



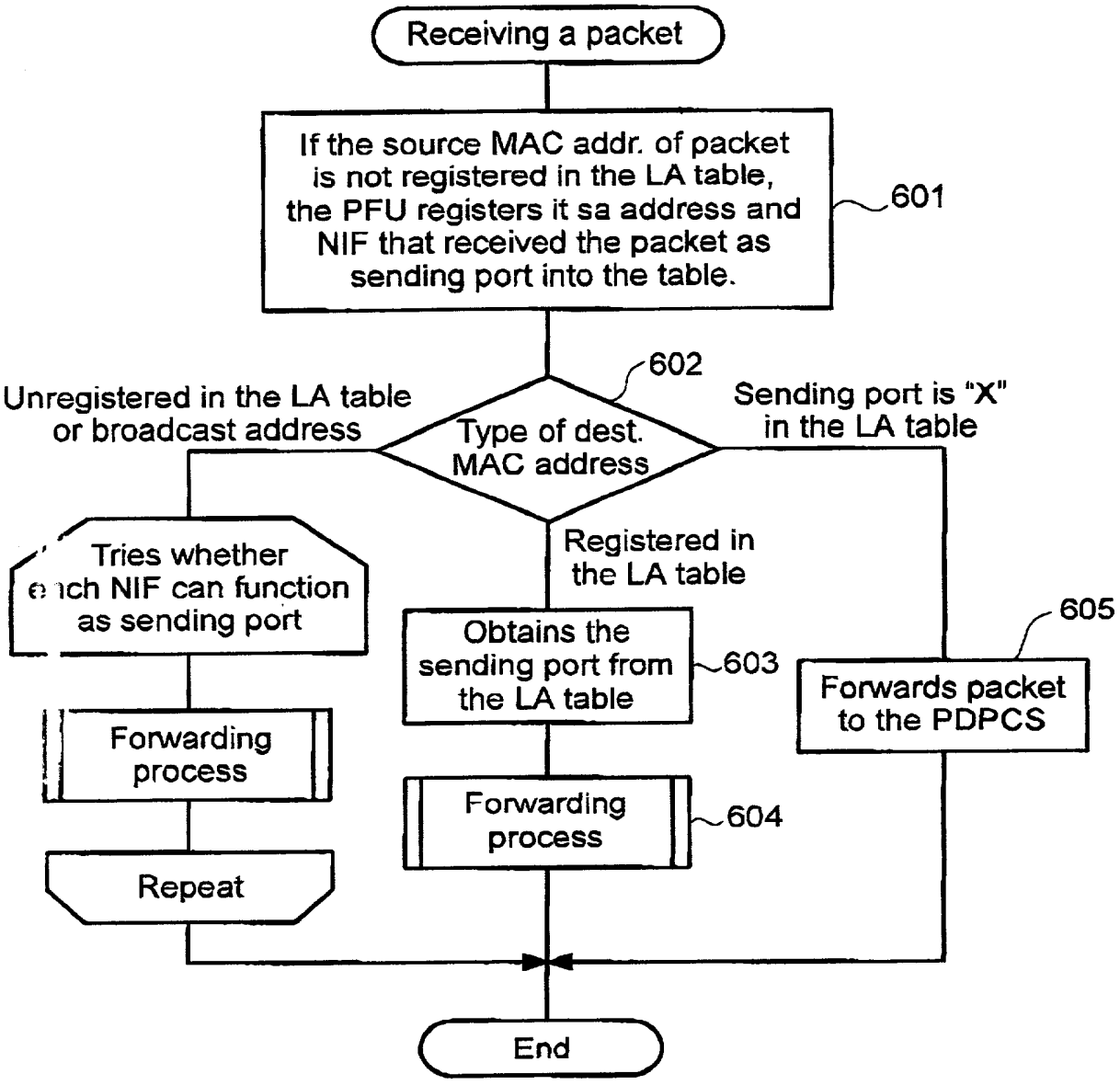
SV-AUTH : Server for Authentication
UT : User Terminal

FIG.5



SV-AUTH : Server for Authentication

FIG.6



LA : Learned Address
NIF : Network Interface
PFU : Packet Forwarding Unit
PDPCS : Processor for Directive Packets to Change State

FIG.7

108 301 302

#	Address	Sending Port
1	22:22:00:11:11:11	A
2	22:22:00:22:22:22	B
3	22:22:00:FF:FF:FF	X
4	22:22:FF:00:00:01	C

FIG.8

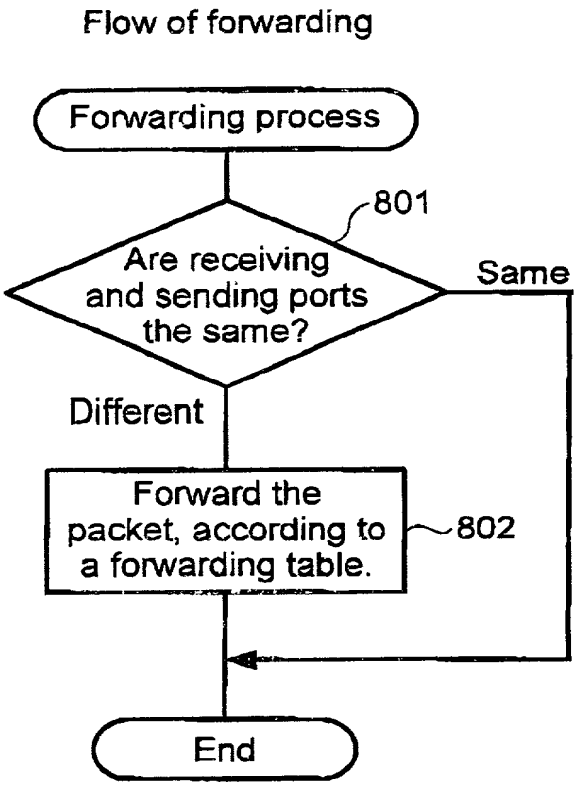
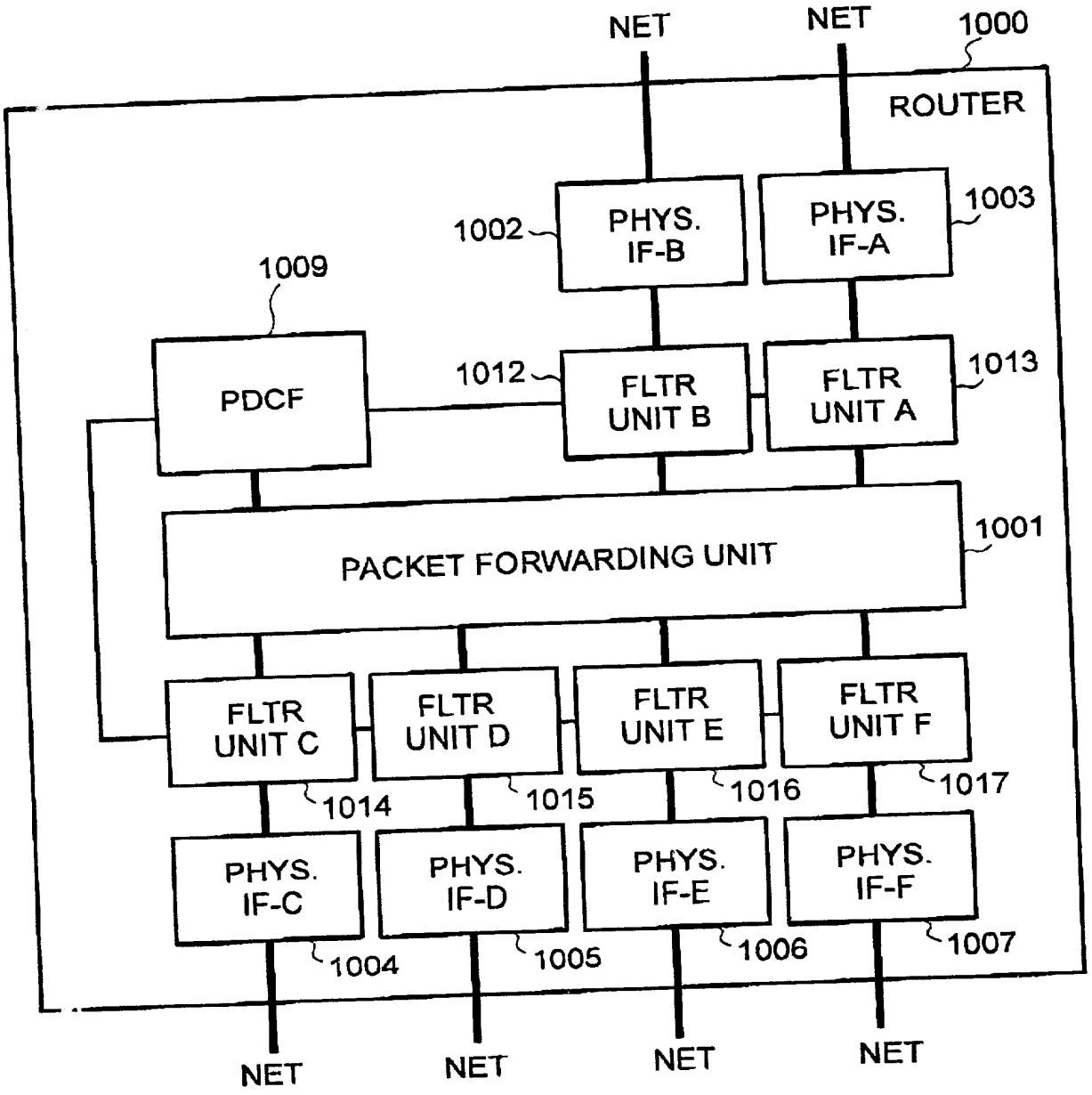


FIG.9

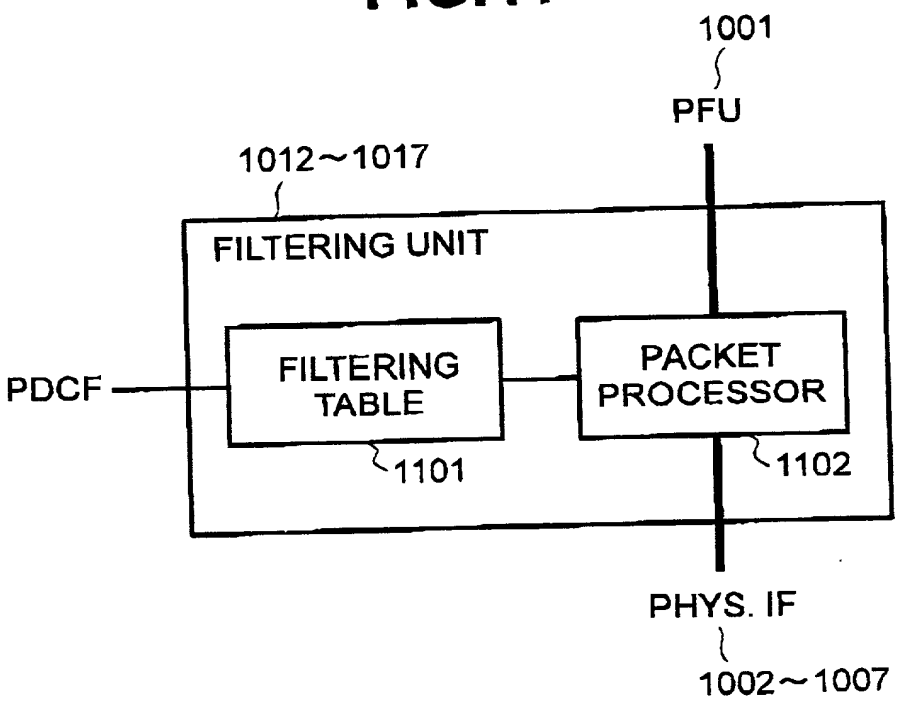
		901 State of Receiving Port		
		Connected	Disconnected	Stateless
State of Sending Port	Connected	Forward	Discard	Forward
	Disconnected	Discard	Discard	Forward
	Stateless	Forward	Forward	Forward

FIG.10



PHYS-IF : Physical Interface
PDCF : Processor for Directives to Change Filtering
FLTR : Filtering

FIG.11



PHYS. IF : Physical Interface
PDCF : Processor for Directives to Change Filtering
PFU : Packet Forwarding Unit

FIG.12

1101 #	1201 Dest. Addr. Condition	1202 Source Addr. Condition	1203 Forward/Discard Flag
1	192.168.1.1	Arbitrary	Forward
2	Arbitrary	Arbitrary	Discard

FIG.13

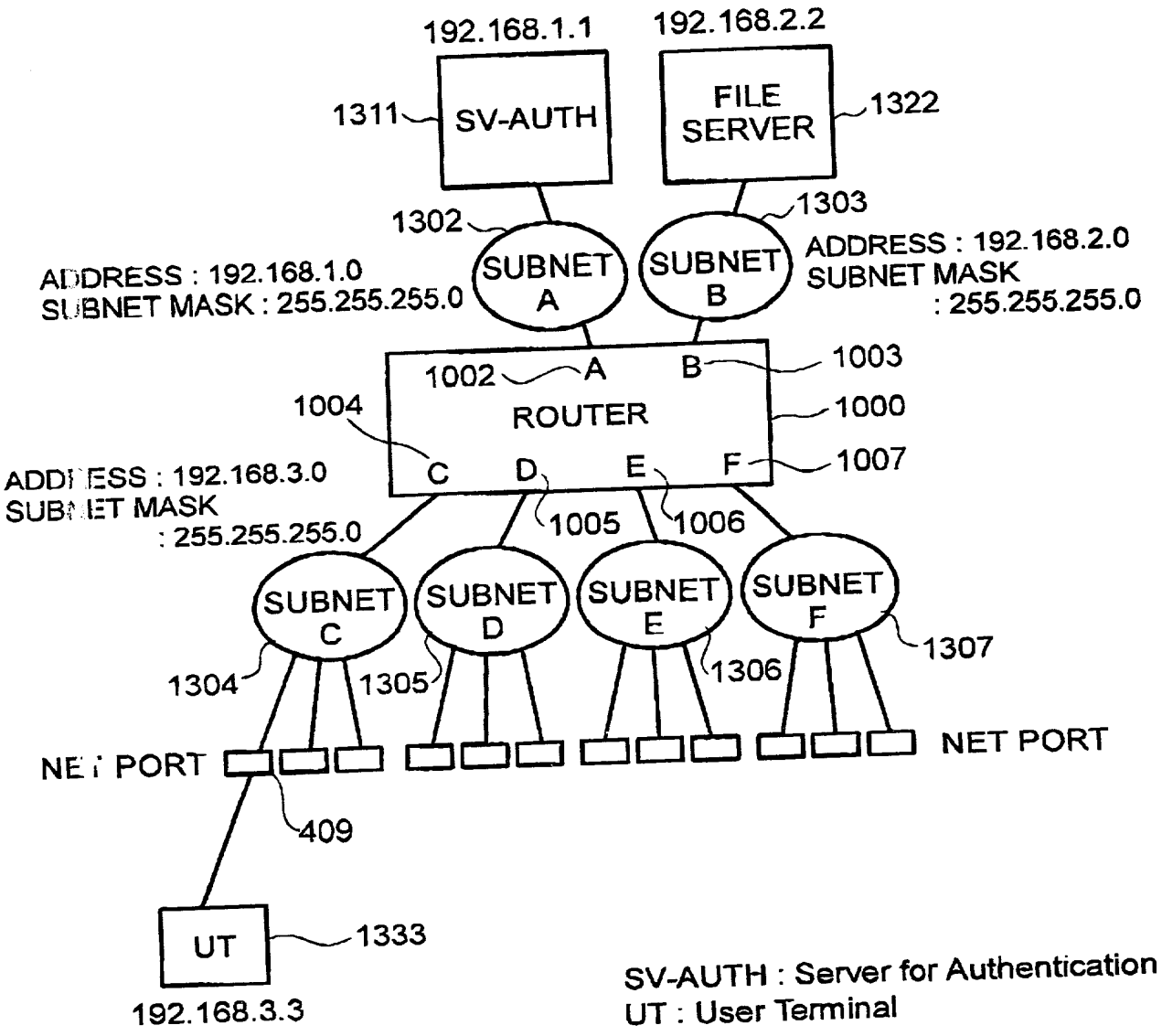
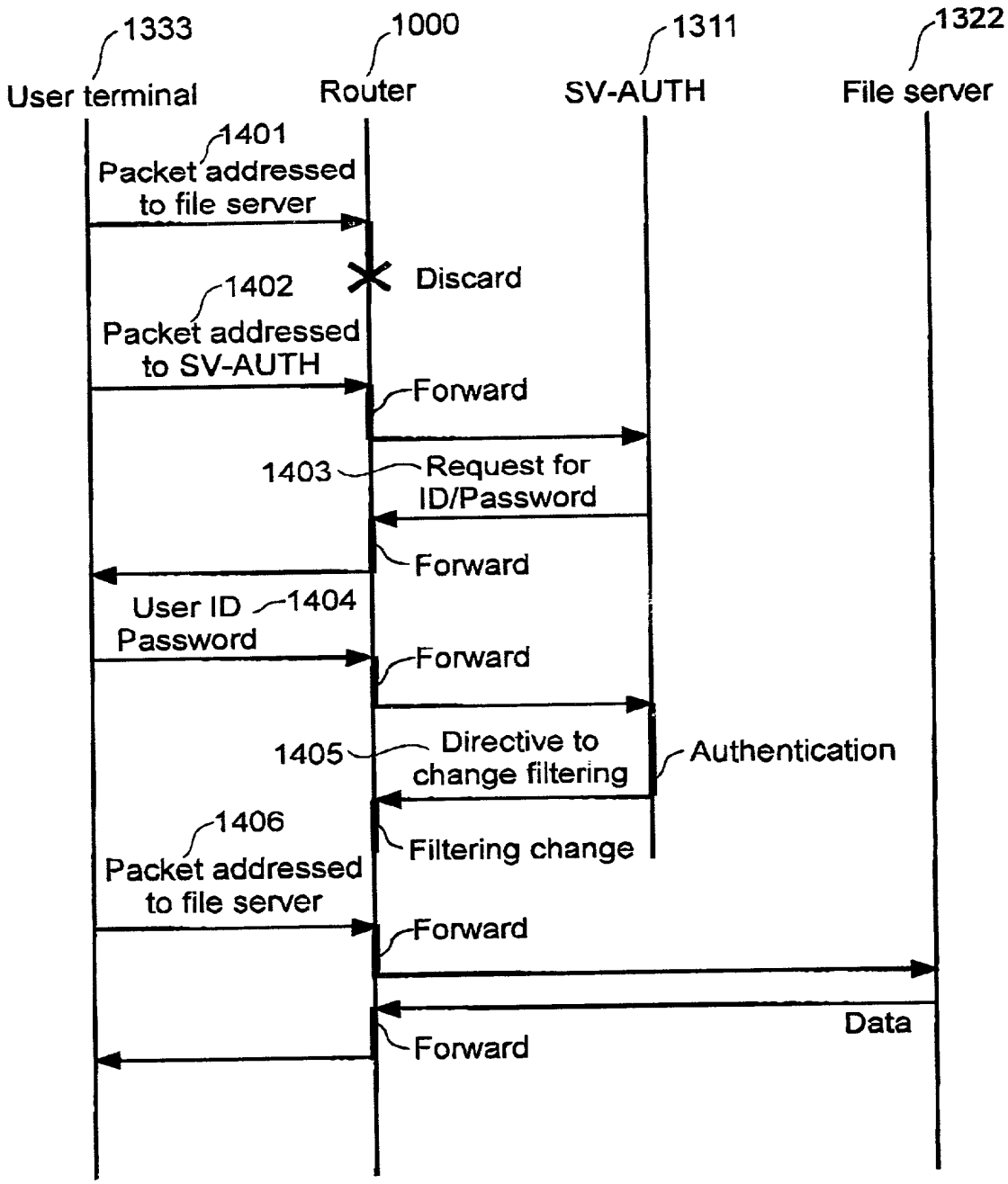

192.168.1.1
192.168.2.2
1311
SV-AUTH
FILE SERVER
1322
1302
1303
ADDRESS : 192.168.1.0
SUBNET MASK : 255.255.255.0
SUBNET A
SUBNET B
ADDRESS : 192.168.2.0
SUBNET MASK
: 255.255.255.0
1002
A
B
1003
1004
ROUTER
1000
ADDRESS : 192.168.3.0
SUBNET MASK
: 255.255.255.0
C
D
E
F
1007
1005
1006
SUBNET C
SUBNET D
SUBNET E
SUBNET F
1307
1304
1305
1306
NET PORT
NET PORT
409
UT
1333
192.168.3.3
SV-AUTH : Server for Authentication
UT : User Terminal

FIG.14

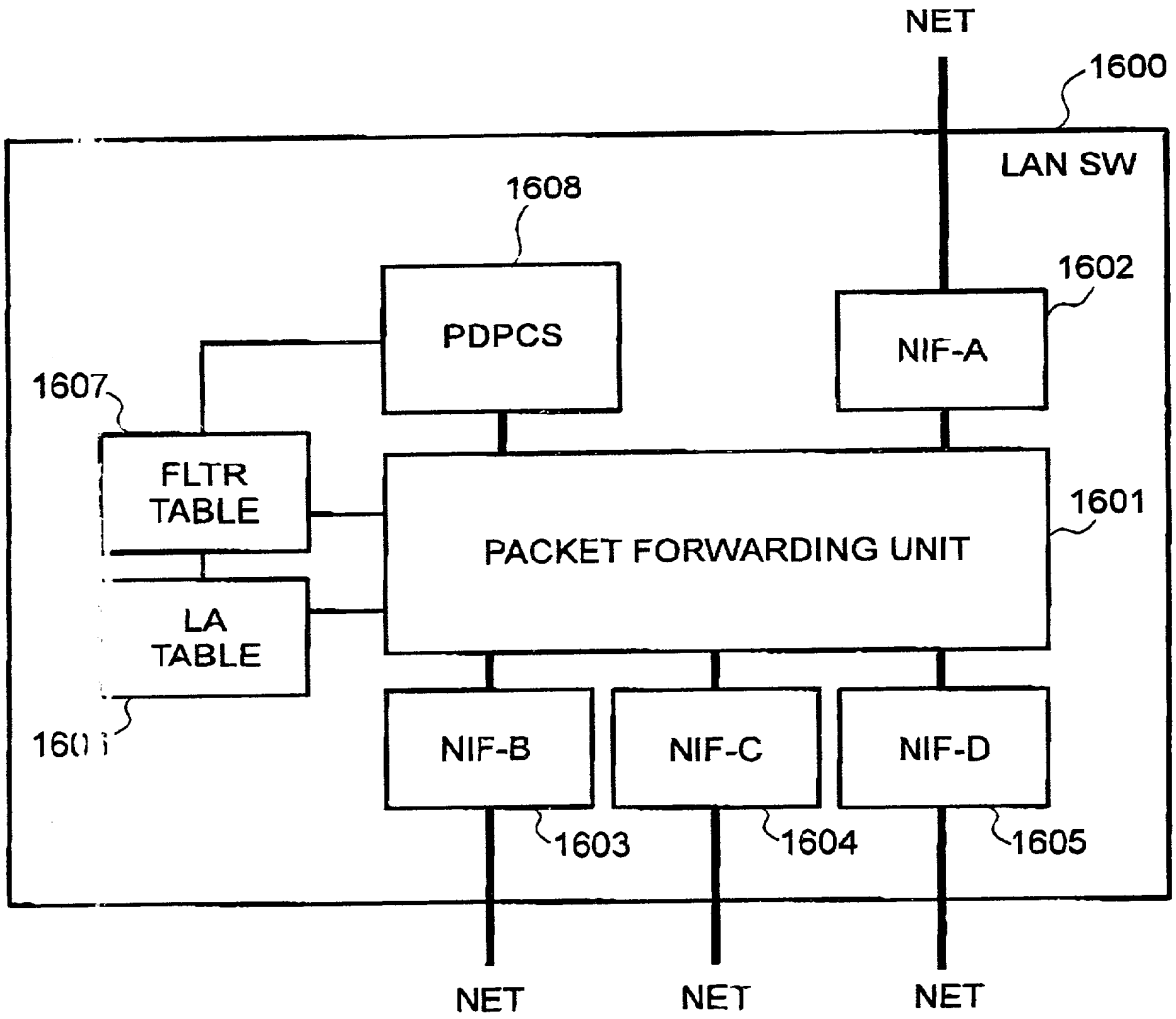


SV-AUTH : Server for Authentication

FIG.15

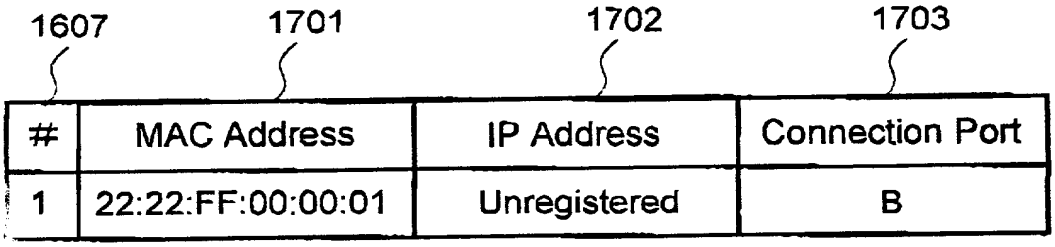
1101 #	1201 Dest. Addr. Condition	1202 Source Addr. Condition	1203 Forward/Discard Flag
1	Arbitrary	192.168.3.3	Forward
2	192.168.1.1	Arbitrary	Forward
3	Arbitrary	Arbitrary	Discard

FIG.16



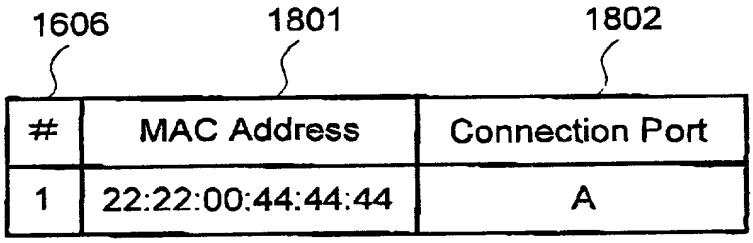
NIF : Network Interface
PDPCS : Processor for Directives Packets to Change State
FLTR : Filtering
LA : Learned Address

FIG.17



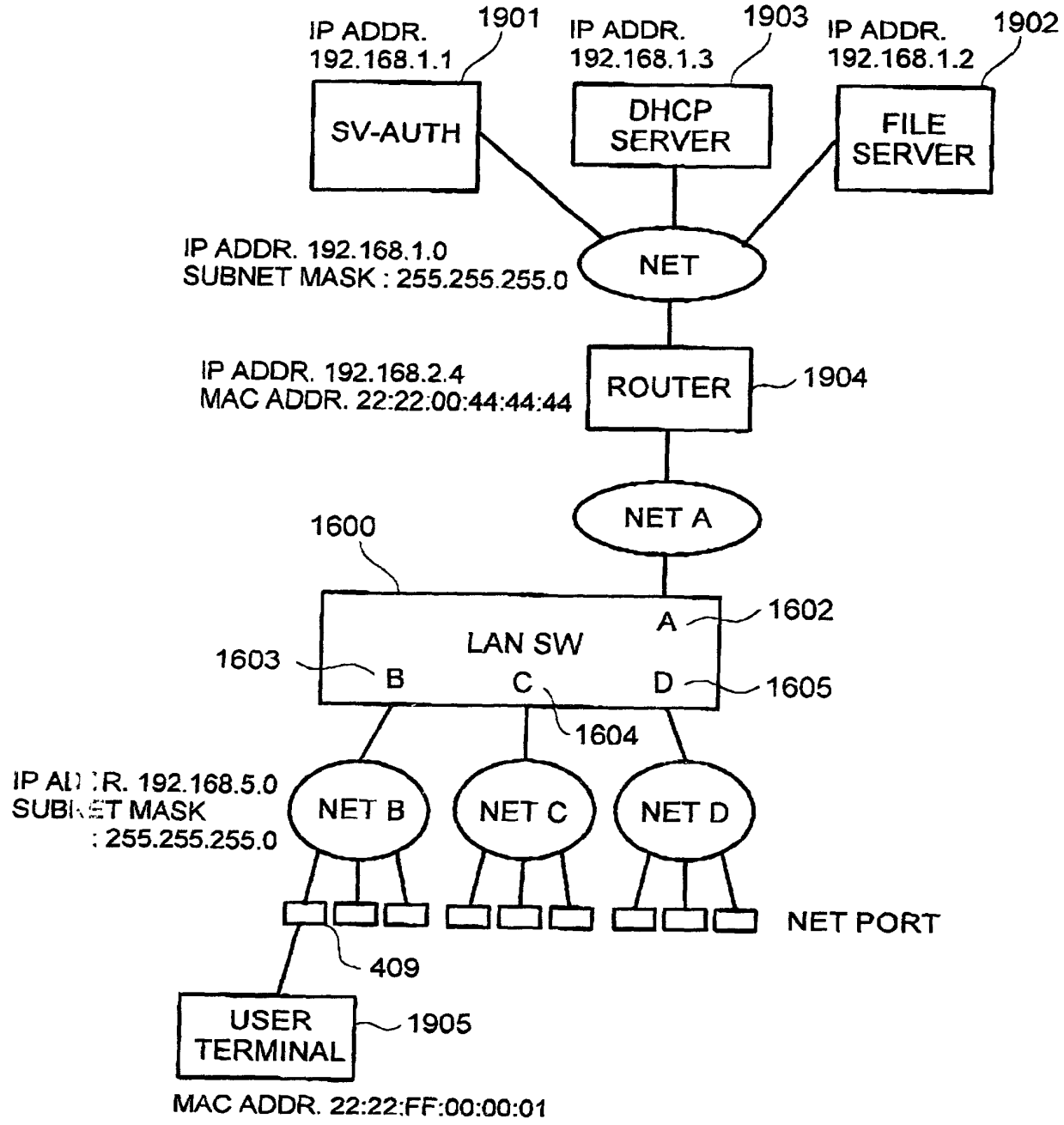
#	MAC Address	IP Address	Connection Port
1	22:22:FF:00:00:01	Unregistered	B

FIG.18



#	MAC Address	Connection Port
1	22:22:00:44:44:44	A

FIG.19



SV-AUTH : Server for Authentication

FIG.20

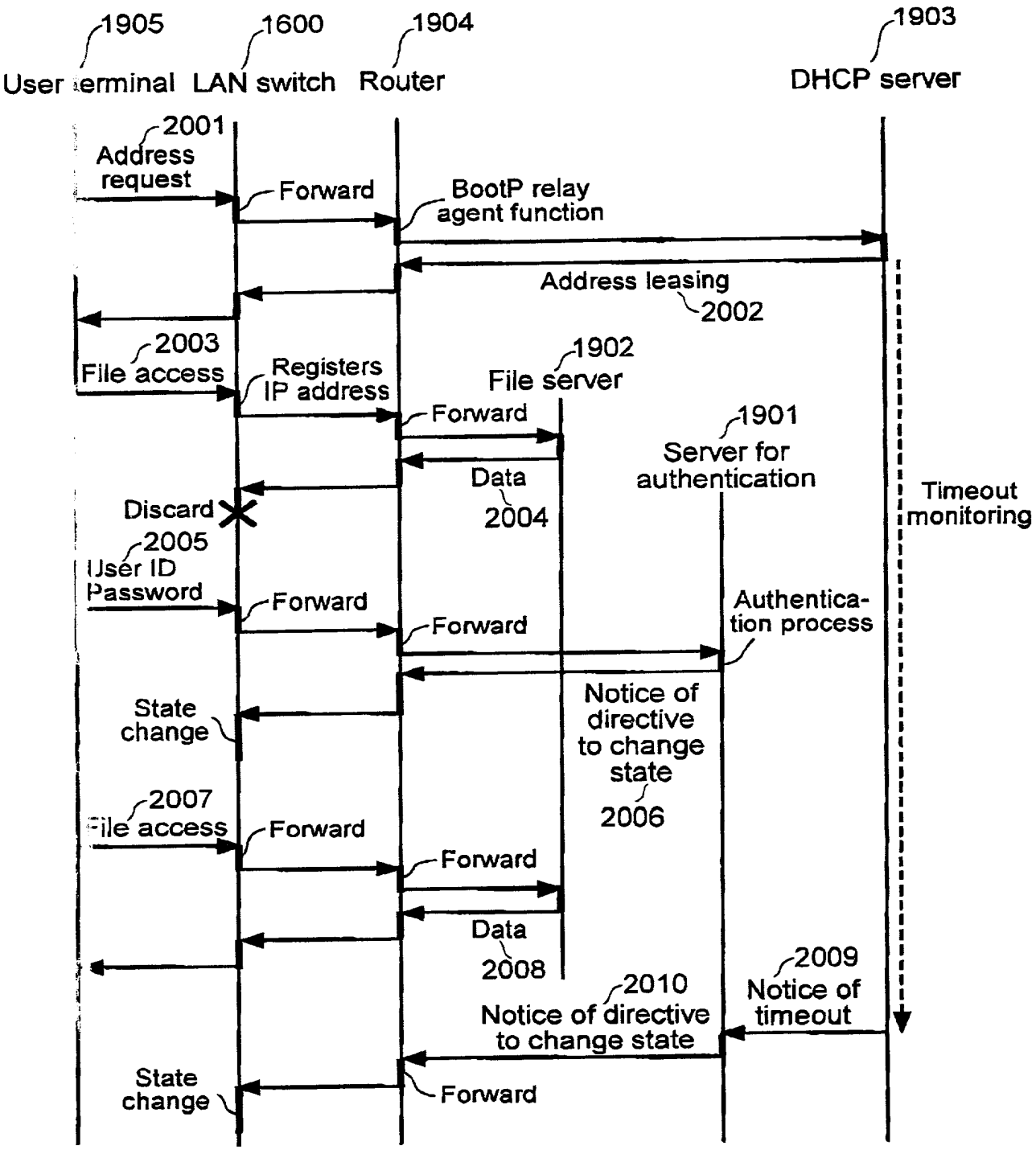

1905
1600
1904
1903
User terminal
LAN switch
Router
DHCP server
2001
Address request
Forward
BootP relay agent function
Address leasing
2002
2003
File access
Registers IP address
1902
File server
Forward
1901
Server for authentication
Data
2004
Timeout monitoring
Discard
2005
User ID Password
Forward
Forward
Authentica-tion process
State change
Notice of directive to change state
2006
2007
File access
Forward
Forward
Data
2008
2009
Notice of timeout
2010
Notice of directive to change state
State change
Forward

FIG.21

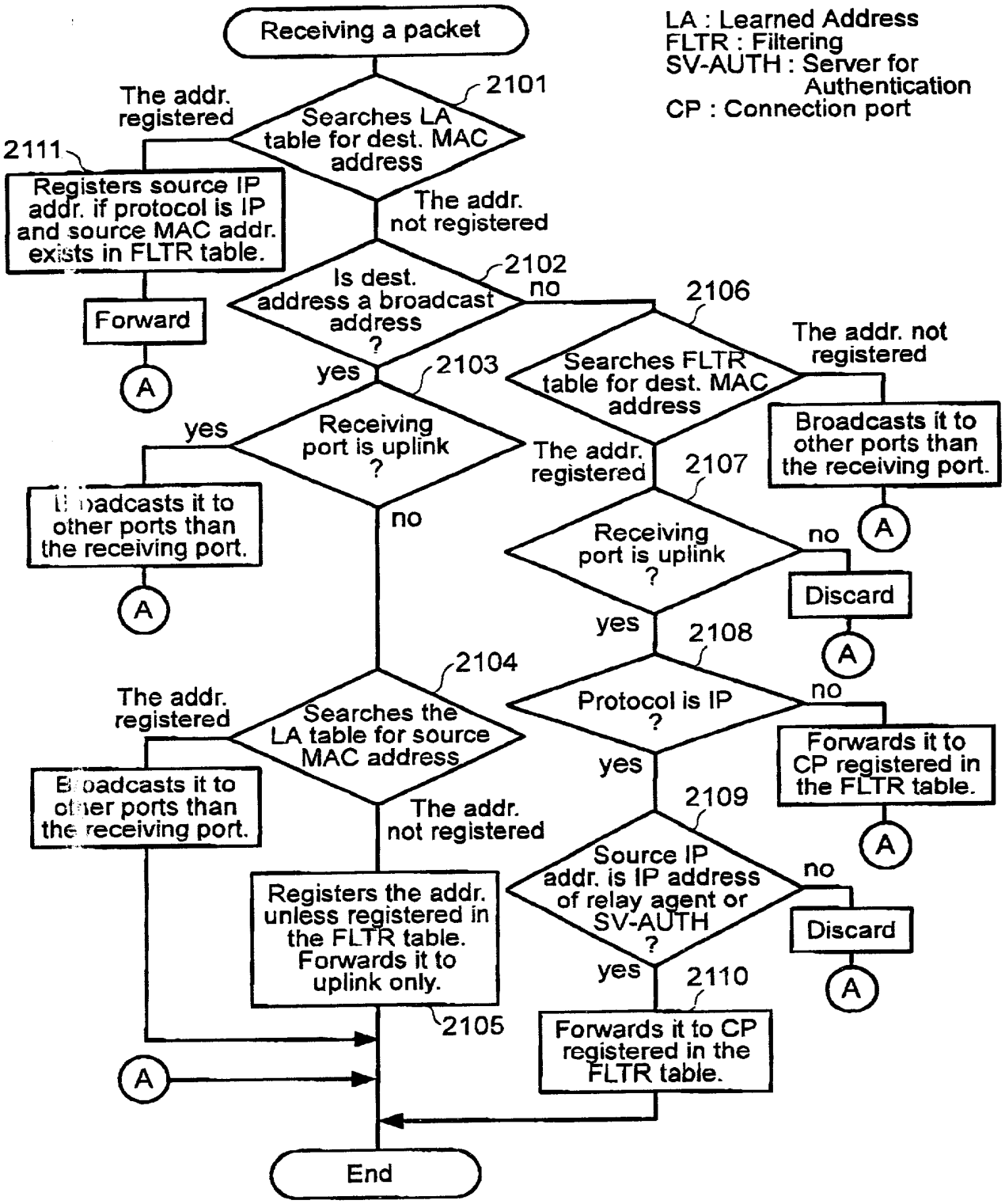

LA : Learned Address
FLTR : Filtering
SV-AUTH : Server for Authentication
CP : Connection port
Receiving a packet
2101
Searches LA table for dest. MAC address
The addr. registered
2111
Registers source IP addr. if protocol is IP and source MAC addr. exists in FLTR table.
Forward
A
The addr. not registered
2102
Is dest. address a broadcast address ?
no
yes
2103
Receiving port is uplink ?
yes
Broadcasts it to other ports than the receiving port.
A
no
2104
Searches the LA table for source MAC address
The addr. registered
Broadcasts it to other ports than the receiving port.
The addr. not registered
Registers the addr. unless registered in the FLTR table. Forwards it to uplink only.
2105
A
2106
Searches FLTR table for dest. MAC address
The addr. not registered
Broadcasts it to other ports than the receiving port.
A
The addr. registered
2107
Receiving port is uplink ?
no
Discard
A
yes
2108
Protocol is IP ?
no
Forwards it to CP registered in the FLTR table.
A
yes
2109
Source IP addr. is IP address of relay agent or SV-AUTH ?
no
Discard
A
yes
2110
Forwards it to CP registered in the FLTR table.
End

FIG.22

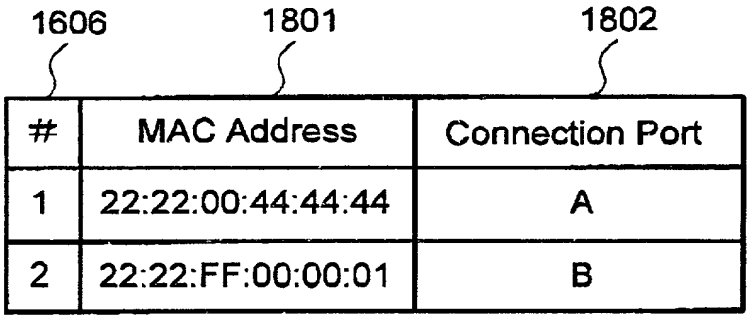

1606
1801
1802
#
MAC Address
Connection Port
1
22:22:00:44:44:44
A
2
22:22:FF:00:00:01
B

FIG.23

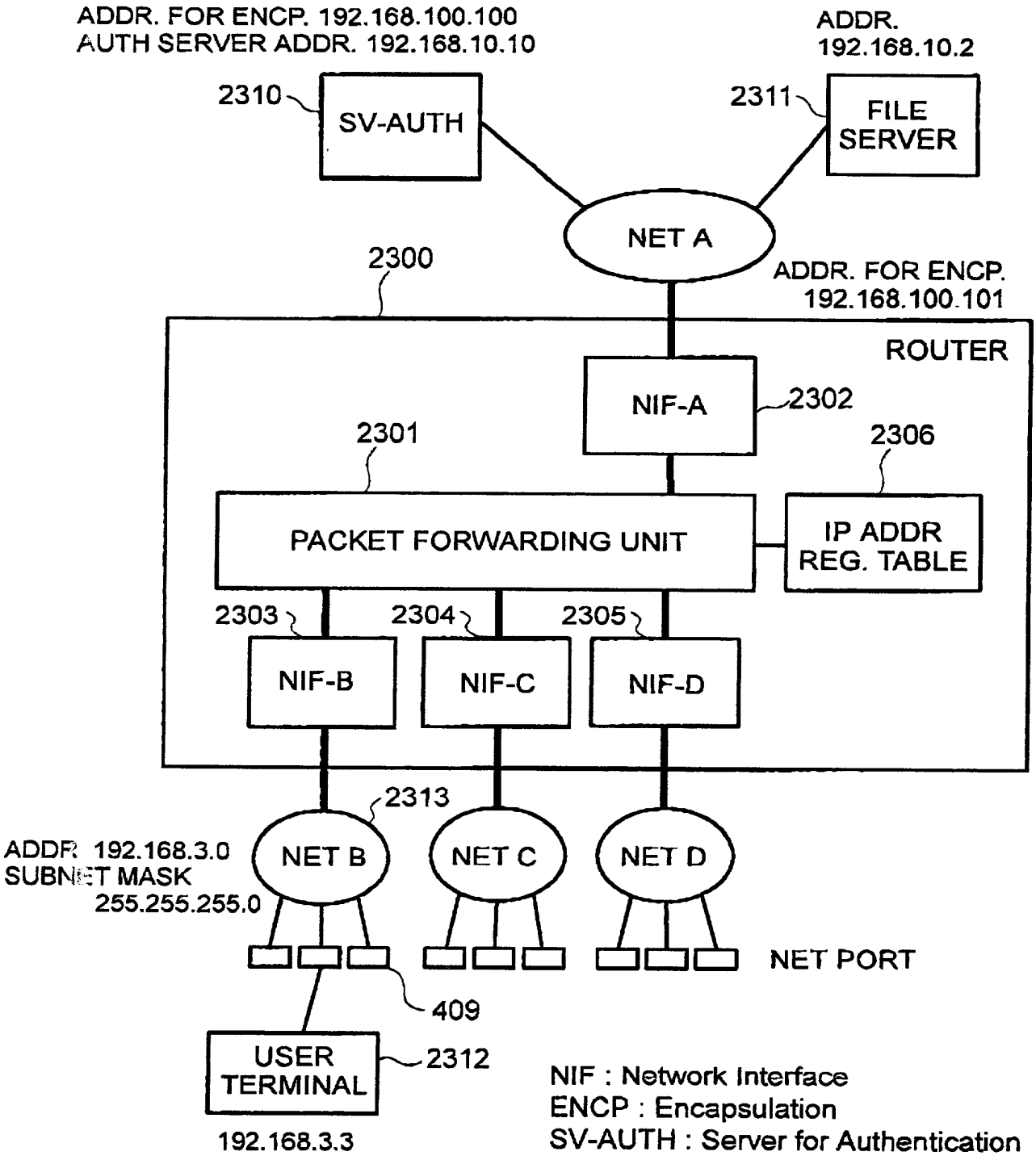

ADDR. FOR ENCP. 192.168.100.100
AUTH SERVER ADDR. 192.168.10.10
ADDR.
192.168.10.2
2310
SV-AUTH
2311
FILE SERVER
NET A
2300
ADDR. FOR ENCP.
192.168.100.101
ROUTER
NIF-A
2302
2301
2306
PACKET FORWARDING UNIT
IP ADDR REG. TABLE
2303
2304
2305
NIF-B
NIF-C
NIF-D
2313
ADDR 192.168.3.0
SUBNET MASK
255.255.255.0
NET B
NET C
NET D
NET PORT
409
USER TERMINAL
2312
192.168.3.3
NIF : Network Interface
ENCP : Encapsulation
SV-AUTH : Server for Authentication

FIG.24

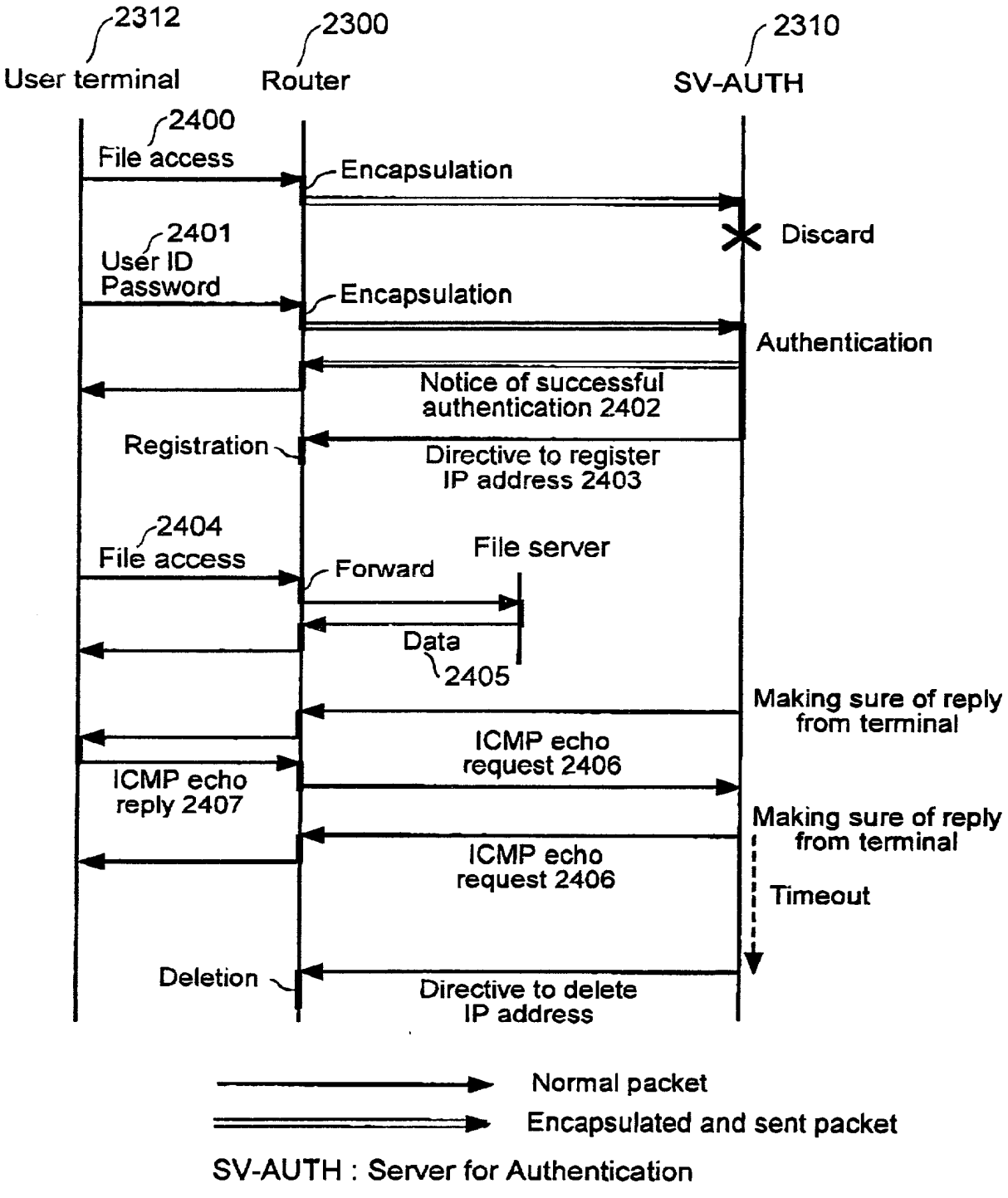
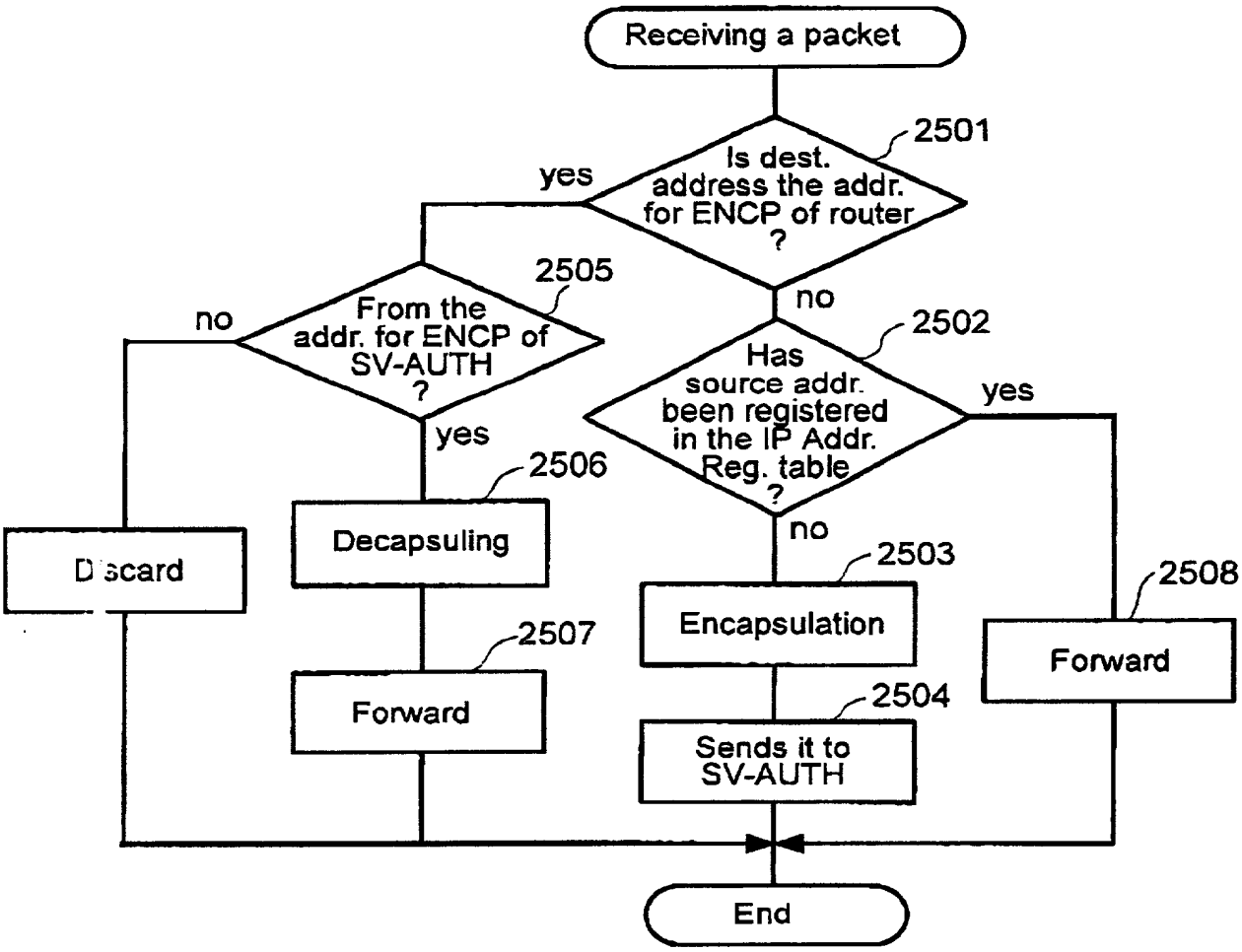
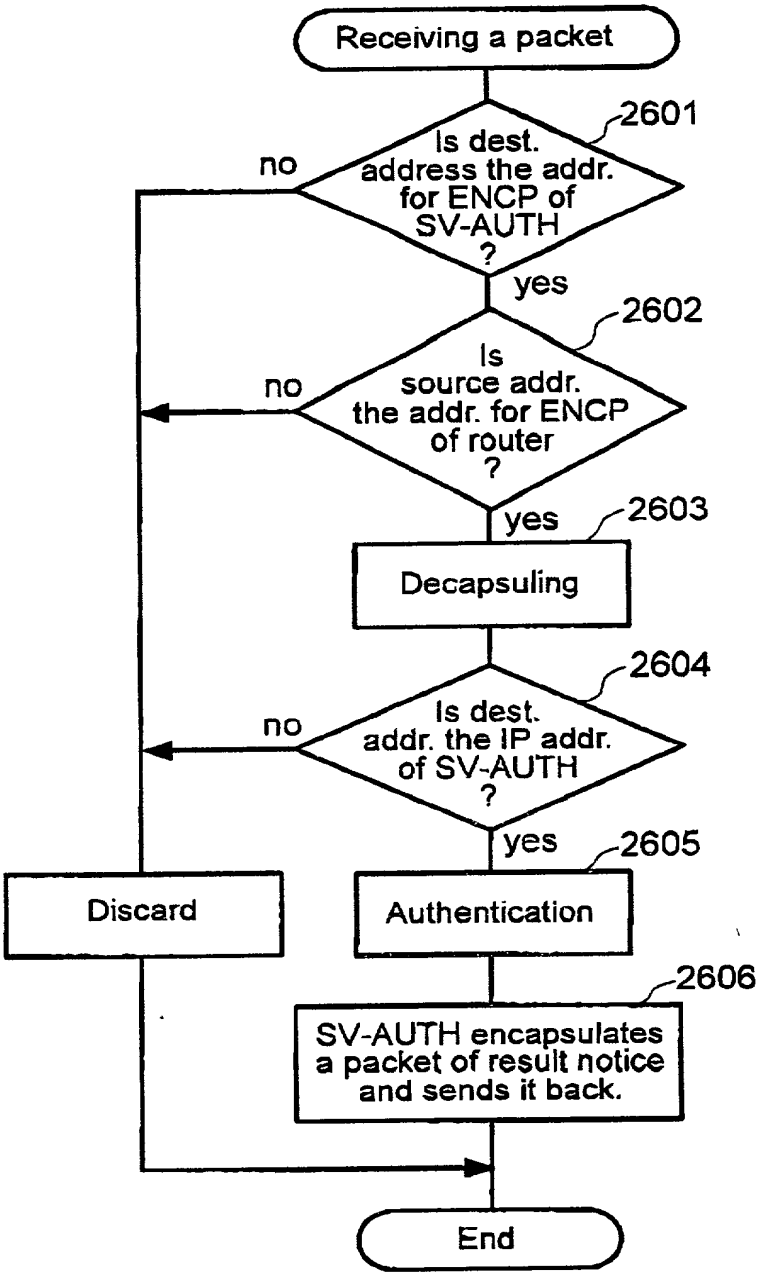

2312
User terminal
2300
Router
2310
SV-AUTH
2400
File access
Encapsulation
Discard
2401
User ID
Password
Encapsulation
Authentication
Notice of successful authentication 2402
Registration
Directive to register IP address 2403
2404
File access
File server
Forward
Data
2405
Making sure of reply from terminal
ICMP echo request 2406
ICMP echo reply 2407
Making sure of reply from terminal
ICMP echo request 2406
Timeout
Deletion
Directive to delete IP address
Normal packet
Encapsulated and sent packet
SV-AUTH : Server for Authentication

FIG.25



ENCP : Encapsulation
SV-AUTH : Server for Authentication

FIG.26



ENCP : Encapsulation
SV-AUTH : Server for Authentication

FIG.27

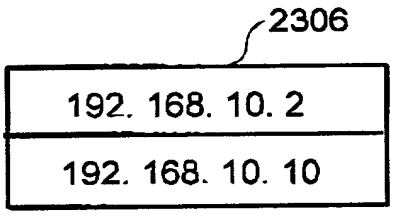


FIG.28

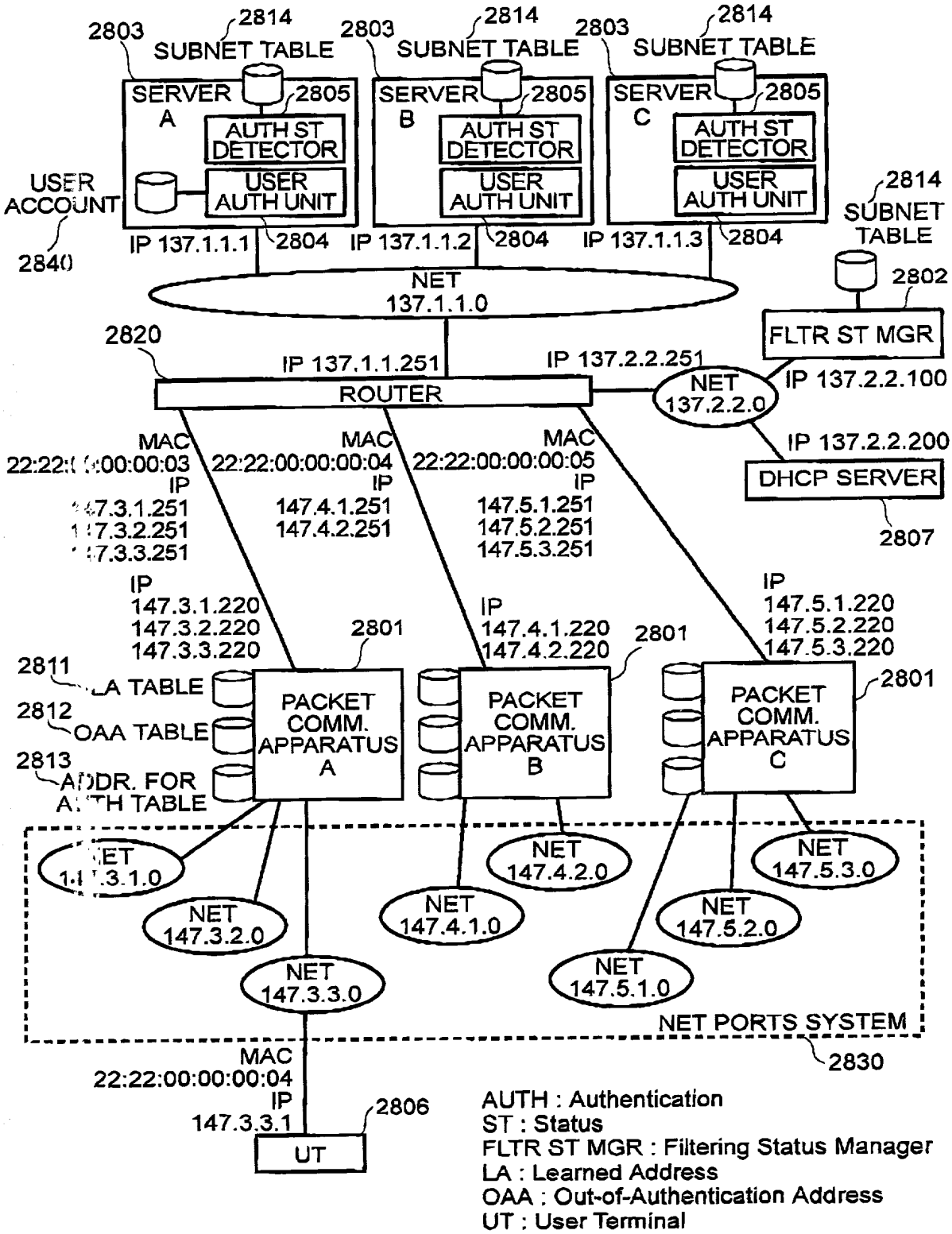

2803
2814
SUBNET TABLE
SERVER A
2805
AUTH ST DETECTOR
USER AUTH UNIT
USER ACCOUNT
2840
IP 137.1.1.1
2804
SERVER B
IP 137.1.1.2
SERVER C
IP 137.1.1.3
NET 137.1.1.0
2820
ROUTER
IP 137.1.1.251
IP 137.2.2.251
NET 137.2.2.0
IP 137.2.2.100
FLTR ST MGR
2802
IP 137.2.2.200
DHCP SERVER
2807
MAC 22:22:00:00:00:03
IP 147.3.1.251
147.3.2.251
147.3.3.251
MAC 22:22:00:00:00:04
IP 147.4.1.251
147.4.2.251
MAC 22:22:00:00:00:05
IP 147.5.1.251
147.5.2.251
147.5.3.251
IP 147.3.1.220
147.3.2.220
147.3.3.220
IP 147.4.1.220
147.4.2.220
IP 147.5.1.220
147.5.2.220
147.5.3.220
2801
2811
LA TABLE
2812
OAA TABLE
2813
ADDR. FOR AUTH TABLE
PACKET COMM. APPARATUS A
PACKET COMM. APPARATUS B
PACKET COMM. APPARATUS C
NET 147.3.1.0
NET 147.3.2.0
NET 147.3.3.0
NET 147.4.1.0
NET 147.4.2.0
NET 147.5.1.0
NET 147.5.2.0
NET 147.5.3.0
NET PORTS SYSTEM
2830
MAC 22:22:00:00:00:04
IP 147.3.3.1
2806
UT
AUTH : Authentication
ST : Status
FLTR ST MGR : Filtering Status Manager
LA : Learned Address
OAA : Out-of-Authentication Address
UT : User Terminal

FIG.29

SUBNET TABLE

2814 2901 2902 2903 2904

#	Subnet Addr.	Subnet Mask	IP Addr. of FLTR ST MGR	IP Addr. of Packet comm. apparatus
1	147.3.1.0	255.255.255.0	137.2.2.100	147.3.1.220
2	147.3.2.0	255.255.255.0	137.2.2.100	147.3.1.220
3	147.3.3.0	255.255.255.0	137.2.2.100	147.3.1.220
4	147.4.1.0	255.255.255.0	137.2.2.100	147.4.1.220
5	147.4.2.0	255.255.255.0	137.2.2.100	147.4.1.220
6	147.5.1.0	255.255.255.0	137.2.2.100	147.5.1.220
7	147.5.2.0	255.255.255.0	137.2.2.100	147.5.1.220
8	147.5.3.0	255.255.255.0	137.2.2.100	147.5.1.220

FIG.30

TABLE. ADDRESS FOR AUTH

2813

#	Server Addr.
1	137. 1. 1. 1
2	137. 1. 1. 2
3	137. 1. 1. 3

FIG.31

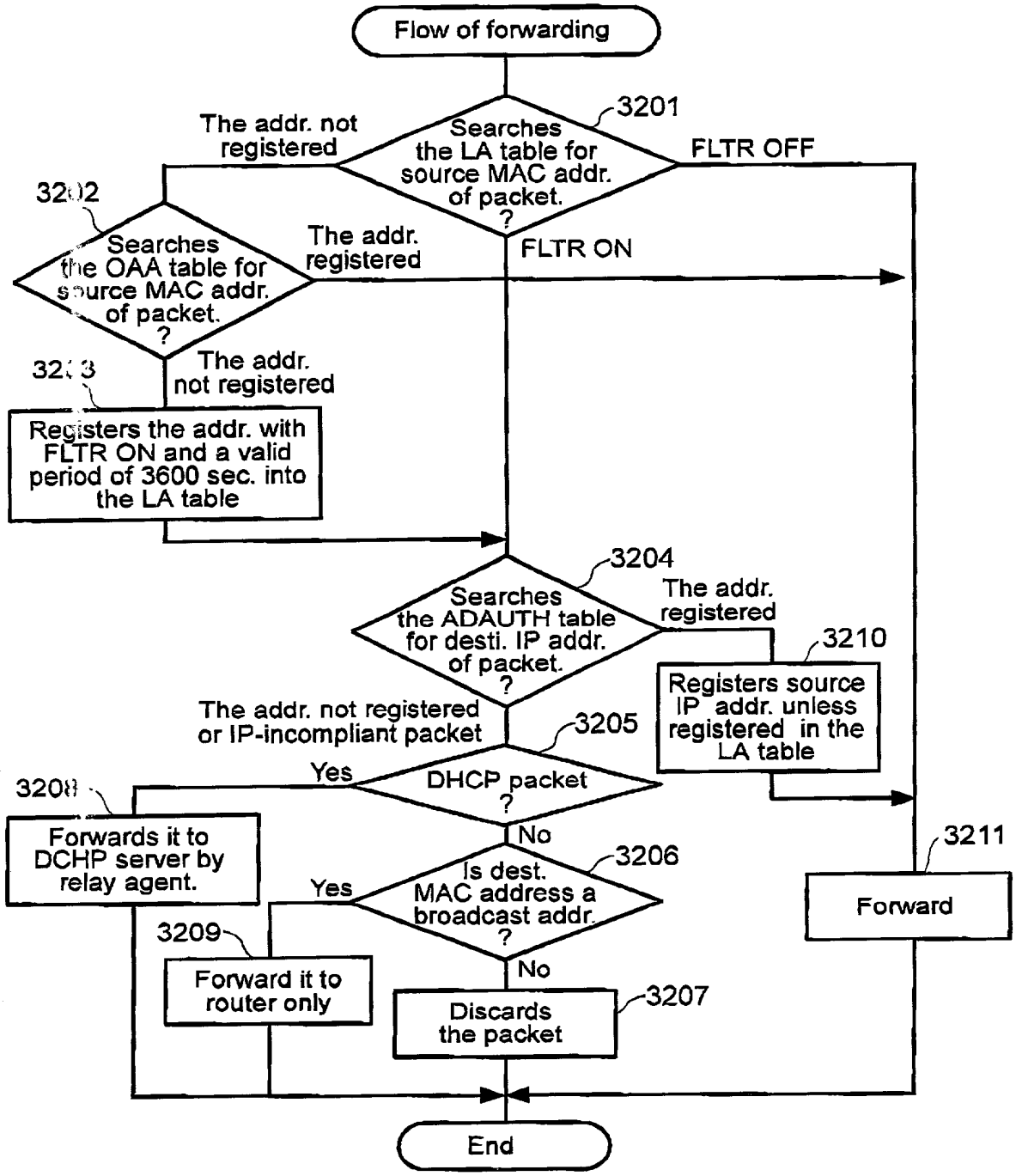
TABLE. OUT-OF-AUTH ADDRESS
(PACKET COMM. APPARATUS A)

2812

#	Out-of-AUTH Addr.
1	22:22:00:00:00:03

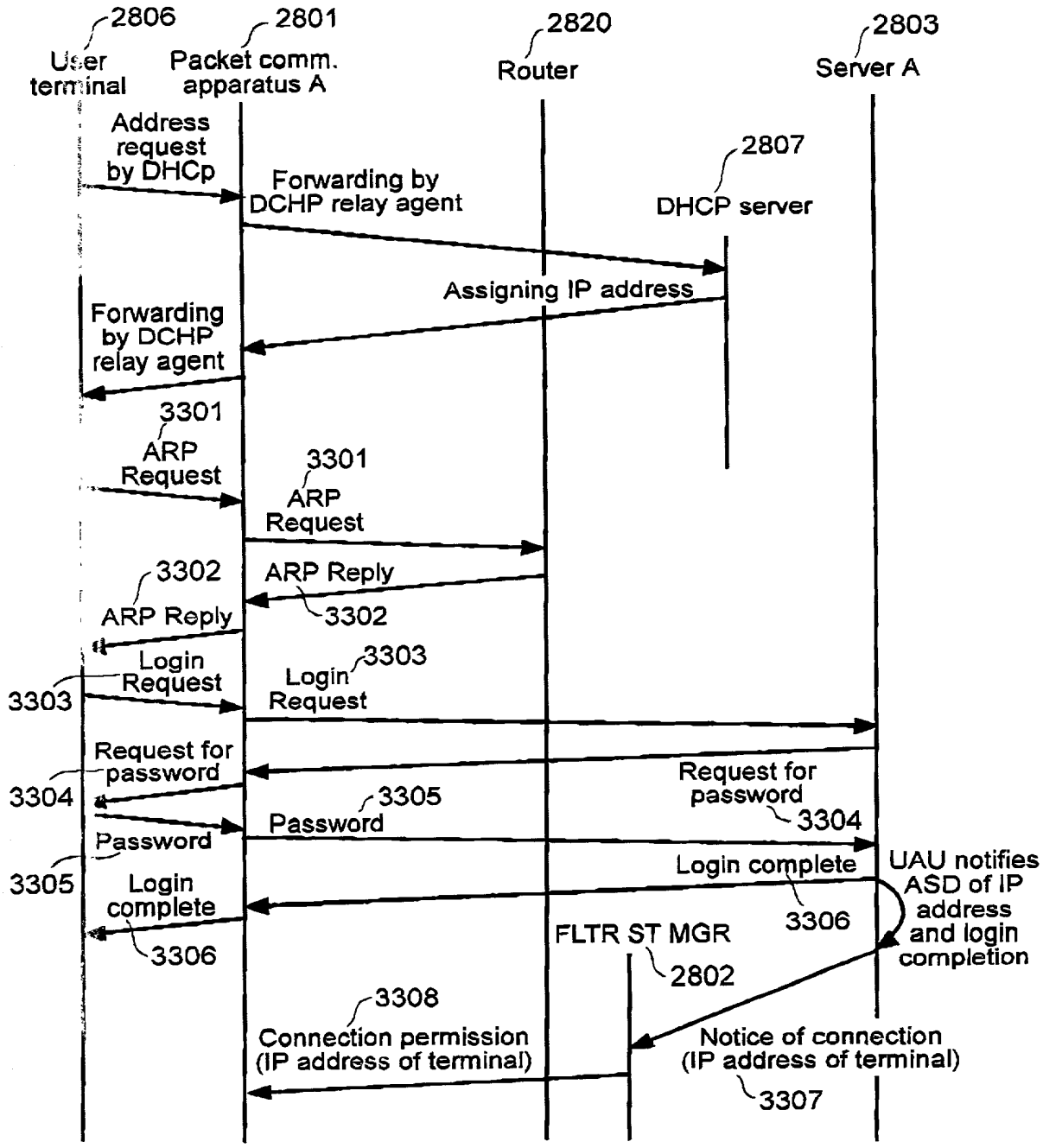
AUTH : Authentication
FLTR ST MGR : Filtering Status Manager

FIG.32



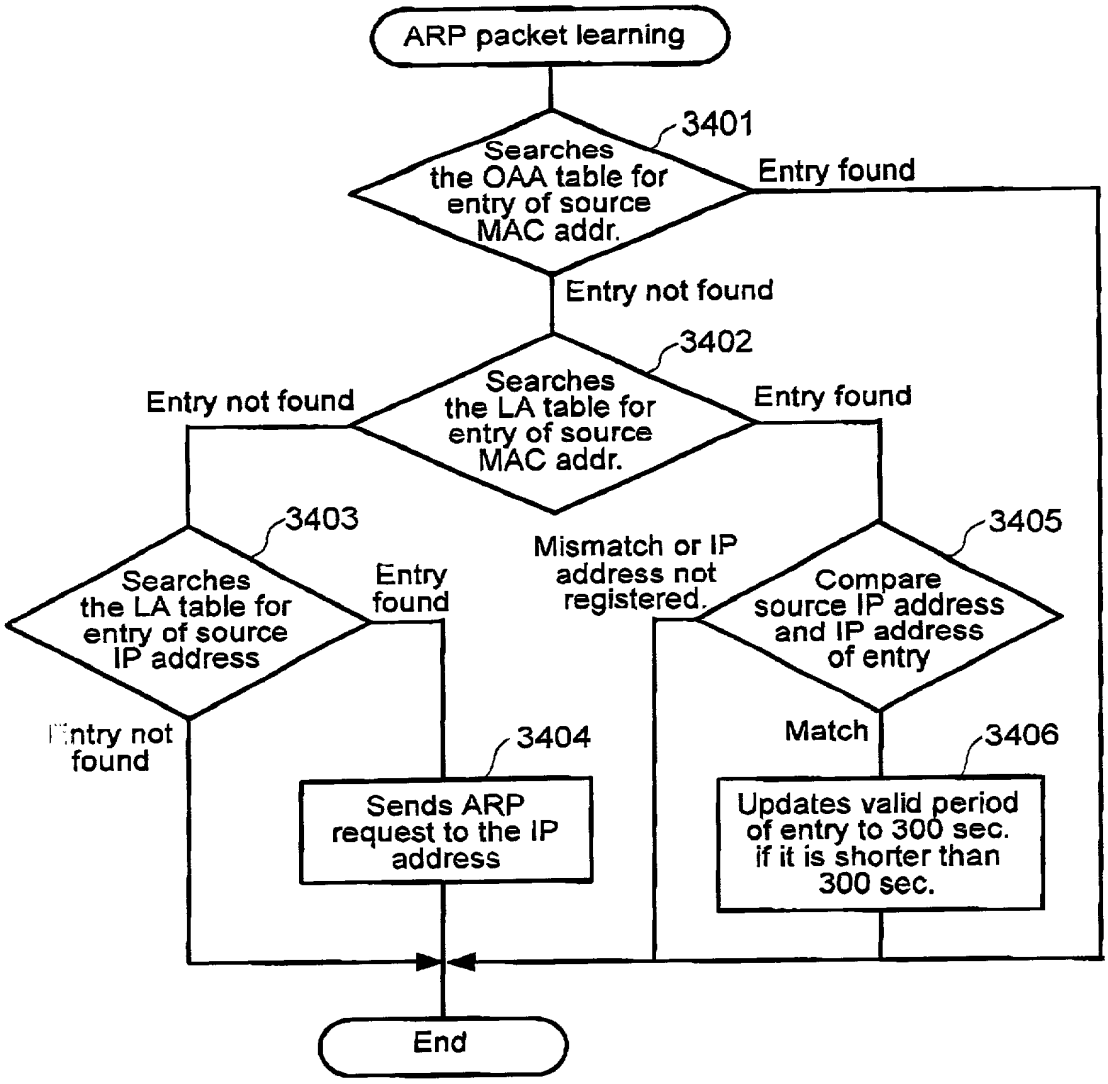
LA : Learned Address
OAA : Out-of-Authentication Address
FLTR : Filtering
ADAUTH : Address for Authentication

FIG.33



UAU : User Authentication Unit
ASD : Authentication States Detector
FLTR ST MGR : Filtering Status Manager

FIG.34



LA : Learned Address
OAA : Out-of-Authentication Address

FIG.35

2811

LEARNED ADDR. TABLE

#	MAC Addr.	IP Addr.	Status	Valid Period
1	22:22:00:11:11:11	0.0.0.0	Filtering ON	3600 sec.

FIG.36

2811

LEARNED ADDR. TABLE

#	MAC Addr.	IP Addr.	Status	Valid Period
1	22:22:00:11:11:11	147.3.3.1	Filtering ON	3600 sec.

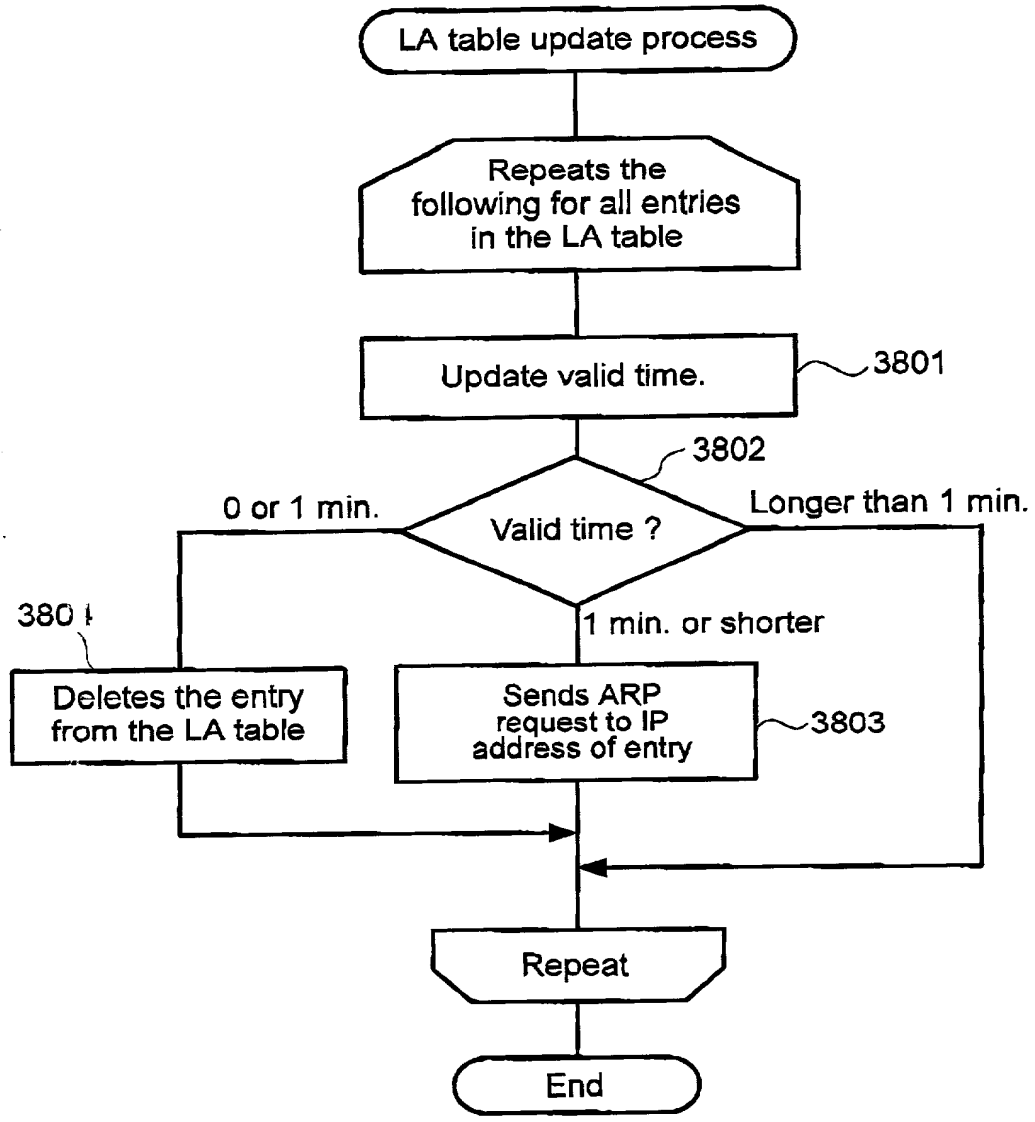
FIG.37

281

LEARNED ADDR. TABLE

#	MAC Addr.	IP Addr.	Status	Valid Period
1	22:22:00:11:11:11	147.3.3.1	Filtering OFF	300 sec.

FIG.38



LA : Learned Address